DIFFERENTIAL EFFECTS OF FACIAL CONFIGURATION ON BILATERAL SKIN CONDUCTANCE AS A FUNCTION OF HOSTILITY

by

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Psychology

(ABSTRACT)

The experiment was designed to investigate group differences by examining the effects of hostility on bilateral measures of skin conductance while making affective facial configurations. Males reporting high and low hostility were instructed in making facial configurations that were identified by raters as happy, angry, or neutral in affective valence. All subjects were asked to make the set of facial configurations twice with unstructured baselines taken prior to each face. The initial hypotheses included: (1) there would be higher skin conductance levels for the facial configuration trials than the baseline trials; (2) there would be more reactivity for the angry facial configuration followed by the happy facial configuration and then by the neutral facial configuration; (3) the left extremity would show higher conductance levels than the right; (4) the high hostile group would show higher conductance levels across the emotional faces as compared to the neutral facial configuration than the low hostile group; (5) the high hostile group would show higher conductance
levels across both extremities than the low hostile group; and (6) a three-way interaction of group, extremity, and affective facial configuration would be noted. The experimental hypotheses were partially supported. As expected, the facial configuration produced significant increases in skin conductance from baseline across all three facial configurations. Differential effects of facial configuration were found. Skin conductance varied among the groups as a function of the three facial configurations. A three-way Group x Extremity x Block interaction was found. An interaction between group, extremity, and affective facial configuration was not found. Neuropsychological models of emotion are discussed as well as the possibility of altered right cerebral systems in high hostile individuals.
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FACIAL CONFIGURATION, HOSTILITY, AND BILATERAL ASYMMETRY ON GALVANIC SKIN RESPONSE

Introduction: Cerebral Asymmetry in Emotion

The relative contribution of the cerebral hemispheres to emotion and hostility has increasingly become a major focus of research. The investigation of cerebral asymmetry in emotion began with clinical studies of individuals with brain lesions. Lesions of the left hemisphere were found to produce a depressive response while lesions of the right hemisphere were found to produce an inappropriately optimistic or denial response (Gainotti, 1982). Goldstein (1952) noted that a tendency for depressive-catastrophic responses occurs in patients who have suffered a left-hemisphere lesion. It was later noted that individuals with right-hemisphere lesions exhibited an emotional indifference (Hecaen, 1962). Cummings and Mendez (1984) reported that in individuals with infarctions of the right hemisphere, changes in affect and mood were noted. Tucker & Frederick (1989) pointed out that a reasonable interpretation of these effects would be to ascribe the patient's new emotional response pattern to the undamaged hemisphere's supposed dominance. The common pattern put forth by much of the literature supports the proposition that the left hemisphere has a positively valenced emotional orientation while the
right hemisphere has a more negatively valenced emotional orientation (Borod, 1992; Silberman & Weingartner, 1986).

As research continued on brain lateralization, it was found that the interpretation of emotional information, such as facial configuration or tone of voice, showed a strong right hemisphere lateralization. Initially, this lateralization of emotional processing was studied through research focusing on emotional comprehension rather than expression (Beaton, 1979; Bryden, Ley, and Sugarman, 1982; Safer and Leventhal, 1977). Heilman, Scholes, and Watson (1975) tested the ability of left and right-lesioned patients to listen to emotionally intoned sentences and then point to a picture of a face that matched the emotion. The patients with right-brain lesions had significantly more difficulty choosing the matching facial configuration. This effect was confirmed by Tucker, Watson, and Heilman (1976) in another study. Further research also indicated that individuals with left or right-brain lesions showed heightened difficulty in emotional recognition than non-lesioned normals (Heilman, Bowers, Speedie, and Coslett, 1984; Schlanger, Schlanger, and Gerstman, 1976). The left-lesioned subjects did maintain, however, a superiority in emotional processing in these studies.

Later research also demonstrated that emotional speech expression or prosody (non-propositional speech) is affected
by lesion laterality. Kent and Rosenbek (1982) found that right-lesioned patients may speak in a monotone termed an expressive dysprosodia. Borod, Koff, Perlman-Lorch, and Nicholas (in press) found in a study of emotional expressiveness that left-brain damaged patients showed impairment in their use of propositional or literal speech in response to emotion eliciting stimuli and right-brain damaged subjects showed a decrease in the use of facial means for emotional expression.

Other research has focused on the right hemisphere's role in arousal, emotional lability, and inertia of affect. Heilman found hypo-arousal and hypo-reactivity using galvanic skin response (GSR) with a brain-injured population (Heilman, 1993). Heilman (1982) suggested that the right hemisphere may be more in touch with subcortical systems that are important for arousal and intention. Individuals with a dysfunctional right hemisphere would be more likely to show abnormal patterns of autonomic activity which could be characterized as labile behaviorally (Robinson, Parikh, Lipsey, Starkstein, & Price, 1993). Pseudobulbar lability (laughing or crying uncontrollably) has been described with right hemisphere lesions to demonstrate this effect (Heilman, 1993). Tucker and Williamson (1984) also stated that the right hemisphere is more involved in arousal and habituation. Affective inertia as well as inertia of
autonomic responding would likely be noted with right hemisphere damage. Luria and Simernitskaya (1977) had earlier postulated that the right hemisphere is more important than the left hemisphere in perceiving visceral changes as evidenced by lesion studies.

Facial Configuration and Emotion

Izard (1977) earlier proposed a theory of emotion wherein he proposed ten fundamental affect types which interacted with each other through physiological processes. He further proposed a three component theory of emotion involving neural activity, facial expression and face-brain feedback, and subjective experience. Emotion can thus be seen through the output of verbal reports such as "that really angers me" or "I feel very happy", in motoric behavior such as frowning or smiling, and through changes in the autonomic nervous system such as increased heart rate, increased blood pressure, and/or palmar sweating (Ohman and Dimberg, 1978). Further research on facial expression consistency has helped confirm this paradigm (Ekman, Friesen, and Ellsworth, 1972; Ekman, Levenson, and Friesen, 1983).

Ekman (1971) explained that there are universal facial expressions which seem to convey specific emotions. A smile by an American has the same emotional connotation as a smile by an African and likewise, a frown. He proposed a neuro-
cultural theory that explained the interaction of physiological and cultural determinants of certain facial expressions. Initially, Ekman saw facial expressions as part of a facial affect "program" present in everyone. He postulated that when a person experienced a particular emotion, a pattern of movement for facial muscles was triggered by a corresponding neural system. His list of seven basic facial emotions mirrored the categories of emotion found in many other research areas. This list included: (1) happiness; (2) sadness; (3) disgust; (4) fear; (5) surprise; (6) anger; and (7) interest. In later research, Ekman found that just making these facial configurations could produce physiological reactivity patterns similar to those that occur when a subject reports to be actually experiencing the emotion being displayed. However, Schwartz and his associates (1976, 1978, 1980) first demonstrated that imagined emotional states produced facial changes which could be coded as the same emotion that was indicated by the induction. This research also showed that there are distinct physiological response patterns for certain emotions.

Much of the research on affect has focused on behavioral or cognitive references for the interpretation of their effects on an individual rather than on their physiological references. Ohman and Dimberg (1978) stated
that "cold" psychological constructs such as "attention" and "information-processing" have been used to study emotion. However, this trend has begun to be reversed as evidenced by some of the more recent studies integrating facial affect expression with concomitant autonomic response patterns. One problem with focusing on cognitions separate from physiology is that the dualistic nature inherent to the emotion construct acts to confound one's understanding of it. The layman thus defines emotion subjectively using vague terms like "feelings". Interobserver objectivity, however, through the quantification of physiological responses, potentially offers a more scientific approach but still cannot explain the type of internal events occurring. The use of physiological measures in response to objective behavioral configurations of emotion may offer a more stable paradigm for research. Moreover, the individual's emotional interpretation may vary systematically with the behavioral and physiological manifestations.

**Lateralization of Facial Emotion**

Evidence for emotional lateralization of the brain in the processing of facial expressions or configurations has also grown rapidly in the last decade. Campbell, (1978) first noted that subjects, when asked to pose for photographs of facial expression, showed a larger smile on the left side of the face. Borod and Caron (1980) found
that when subjects made both negative and positive faces the left side of the face was rated as more intensely emotional. Similarly, Sackheim, Gur, and Saucey (1978) used split-half composite photographs of actors displaying various facial configurations and found that the left-side composites were rated as more intense. Some further research, however, indicated that spontaneous rather than posed facial emotion did not show this asymmetry (Ekman, Hager, and Friesen, 1981; Moscovitch and Olds, 1982). These findings were disputed by similar studies (Borod, Koff, and White, 1983; Dopson, Beckwith, Tucker, and Bullard-Bates, 1984) though that found spontaneous facial affect, as well as posed, to be asymmetrical.

Functional asymmetry has also been found to vary among positive and negative affective valence. In a review of this literature, Borod, Koff, and Back (1986) found that in studies examining posed expressions, a greater left-face intensity was found for negative emotions while none showed a greater right-face intensity for positive emotions. However, in a study examining spontaneous expressions, Borod et al. (1983) found greater intensities on the left side of the face for negative and positive emotions in males but not females. Further confirmation of these results was given by Dopson et al. (1984), who found a greater left-face intensity for spontaneous expressions following the subject
being asked to recall both positive and negative emotional experiences. In their review, Tucker and Frederick (1989) concluded that the greater intensity for emotional expression on the left side of the face seems to hold for both spontaneous and posed expression. It also seemed that negatively valenced affect, such as anger, produced greater facial affect intensity on the left side of the face. This seemed to also indicate right hemisphere dominance in the expression of negative affect. The present experiment looked at one type of this negative affect, anger/hostility.

Nature of Hostility

Hostility has been viewed through behavioral and cognitive indices in attempts to describe it and to determine the impact of this emotion on other systems (e.g. cardiovascular). Self-reported hostility has been often dichotimized into one of two dimensions; either as an acute state of being or as a persistent trait. State hostility involves an angry or aggressive attitude that may become present in the individual due to some actual or imagined provocation by another individual, an actual or imagined personal failure, or as a replacement for another type of emotive responding. Trait hostility involves a pattern of angry, aggressive, and sometimes violent behaviors coupled with a pervading attitude of cynicism, distrust, and intolerance. A trait hostile person is also more likely to
respond with the state hostile behaviors described above. Since trait hostility as measured by the Cook-Medley Hostility scale has been the focus of research involving long-term physiological effects on health and autonomic nervous system (ANS) responding, it will act as the type of hostility measured and studied in this experiment.

Neuropsychology of Hostility

A link between hostility/anger (a cognitive state) and the body's physiological response to it has long been an area of study within the varied disciplines of psychological research. The physiological manifestations of anger were recorded by Wolff (1950) who examined a patient who had a gastric fistula which allowed his gastric mucosa to be viewed. When the patient felt anger, hostility, or resentment, the mucosa became red in color, engorged with blood, and produced more secretions. In 1953, Ax noted that anger was associated with a rise in the number of skin conductance responses, diastolic blood pressure, and electromyogram responses.

Both anger and altered autonomic reactivity have also been shown to be correlated with right hemisphere dysfunction. Heilman theorized that patients with right-hemisphere dysfunction may have an inadequate arousal level due to problems associated with the brainstem and thalamic activating systems. He then found hypo-arousal and hypo-
reactivity using Galvanic skin response (GSR) among these right-damaged patients (many with posterior lesions). Further evidence of a unilateral neglect in these patients supported this hypothesis of an attention or arousal defect.

Other evidence involves expressive defects associated with left hemisphere damage. Nonfluent aphasics can become very fluent when using expletives. Even aphasic patients with agraphia were able to write emotional words better than non-emotional words. Thus, the right hemisphere dominance in emotional expression seems to become more evident in unilaterally brain damaged individuals.

Harrison, Gorelczenko, & Cook (1990) found that high hostile individuals, identified using the Cook-Medley Hostility scale (CMHO) and the Framingham Type A scale (FRAM), were more likely to identify neutral faces as angry than low hostiles. This was suggestive of a negative affective bias among these individuals. Interestingly, this effect was lateralized with heightened negative affect bias resulting from presentation of neutral faces to the right brain (left visual field). Thus, high hostiles potentially have altered functioning within the right hemisphere.

This experiment replicated the earlier findings of Harrison and Gorelczenko (1990) with men showing greater laterality in affect perception than women. Men were
significantly faster when processing affective facial information when it was presented in the left visual field.

It can also be hypothesized that dysfunction of the anterior right hemisphere may result in altered autonomic functioning as well as more prevalent hostile attitude. The frontal lobe is thought to act in an inhibitory fashion and if the inhibitory process is not functioning normally, an excess in behavior is likely to emerge. Damage or dysfunction in this area may act in a reciprocal fashion on both anger levels and autonomic reactivity. The elevation of either due to external or environmental cues will also stimulate the elevation of the other. Thus a individual with anterior right hemisphere dysfunction demonstrating increased levels of autonomic response due to exercise or physical activity would also be likely to have an increased level of hostility due to the purported locations of emotional and autonomic control in these cortical systems. Likewise, it is possible that a high hostile individual may have a tendency to respond in an autonomically altered fashion to emotional cues such as their own facial configuration.

Some studies have found that various emotions produce differential patterns of autonomic responses such as skin conductance, skin temperature, and heart rate (Ekman, Levenson, & Friesen, 1983; Stemmler, 1984). Ax (1953) found
that anger could be distinguished from fear on the basis of autonomic responses alone. Anger produced larger skin conductance responses, diastolic blood pressure, and muscle tension than fear. More evidence comes from other studies cumulatively indicating definite autonomic patterns for different emotions (Roberts and Weerts, 1982; Schwartz, Weinberger, and Singer, 1981). Wagner (1988), in his review, states that the evidence seems to indicate that emotional specificity does exist. It could also be postulated that emotional specificity may exist among extremities. For example, Harrison (1990) demonstrated that bilateral axial and distal measurements of autonomic reactivity show reliable differences as a function of the orienting response and potentially habituate at different rates. The use of bilateral measurements to explore patterns of autonomic responses has not been successfully examined to date.
**Rationale**

It seems that in individuals expressing a high degree of hostility, functional cerebral asymmetry could be considered to be altered. Heilman further indicates that extreme autonomic reactions may be expected. By using bilateral measurements, instead of the historical unilateral measurement (left hand only), the valence of the emotion experienced may be distinguished by looking at left and right conductance levels comparatively. It can also be noted that during the expression of emotional facial configurations a dysfunctional right hemisphere may result in heightened skin conductance responses as compared to measurements taken from individuals not showing a hostile affect predisposition. This pattern can be viewed more directly by utilizing groups of individuals scoring high and low on the hostility construct as well as by taking bilateral measurements from either extremity. These premises act as the base for this study. By activating the hemispheres through the expression of emotional facial configurations a subsequent autonomic reaction (measured by skin conductance) will be elicited. It is now commonly accepted that the expression of negatively valenced emotion (e.g. anger) is lateralized generally to the right hemisphere while the expression of positively valenced emotion (e.g. happiness) is controlled more globally by both
hemispheres (Silberman & Weingartner, 1986). The neural systems theory of emotion and the theory of altered autonomic functioning in high hostiles were tested by having subjects coded as high hostile and low hostile make facial configurations identified by raters as happy, angry, and neutral facial affects while bilateral measures of skin conductance were taken.
Hypotheses

This study attempted to confirm the neural systems theory and the theory of right hemisphere dysfunction in high hostile individuals by demonstrating that individuals with high levels of hostility would show higher levels of skin conductance and greater reactivity (skin conductance change from baseline to test) than low hostile individuals when making happy or angry facial configurations. The initial hypotheses were as follows: (1) higher skin conductance levels for the facial configuration than the baseline would be found; (2) more reactivity would be noted for angry faces followed by happy faces and then neutral faces; (3) the left extremity would show higher conductance levels than the right; (4) the high hostile group would show higher conductance levels across the emotional faces as compared to the neutral face than the low hostile group; (5) the high hostile group would show higher conductance levels across both extremities than the low hostile group; and (6) a three-way interaction of group, extremity, and affective facial configuration would be noted.
Methods

Subjects

Thirty-one male subjects, screened for right-hand dominance, were selected from a psychology department undergraduate subject pool of 102 students based on their scores on the Cook-Medley Hostility Scale (CMHO: Cook & Medley, 1954; see Appendix A) and the Framingham Type A Scale (FTAS: Haynes, Levine, Scotch, & Kannel, 1978; see Appendix B). Subjects were placed into one of two groups; (1) high hostile individuals, or (2) low hostile individuals. Individuals with a known neurological problem, medical illness, or who have experienced significant head trauma were excluded. This information was obtained by a history questionnaire (see Appendix C) which was completed at the time of the administration of the hostility scales. The Beck Depression Inventory (BDI; see Appendix D) and the State-Trait Anxiety scale (STAS; see Appendix E) were also administered in order to examine characteristics of the subject pool. All initial subjects also read and signed an informed consent form (see Appendix F). All thirty-one subjects received extra credit in their coursework for participation in the experiment.

Handedness and Hostility Classification. A handedness questionnaire (Coran, Porac, & Duncan, 1979) was administered to the subject pool (see Appendix G). This 13-
item, behaviorally validated questionnaire assesses four types of lateral preference including hand, foot, eye, and ear. The self-report items are scored as +1 for right, −1 for left, and 0 for both (left or right) hand dominance. The questionnaire was developed from a number of other laterality inventories and tests of hand preference. Criteria for acceptance and right-hand dominance was a score of +6 or above (max = +13) on the questionnaire.

The hostility classifications were made by the CMHO and the FTAS self-report instruments. Both instruments were used to ensure that the two groups were differentiated as accurately as possible. The FTAS contains ten items which are intended to assess feelings of time urgency, competitiveness, and "hard-driving" behaviors. It has been shown to correlate significantly with the Jenkins Activity Survey (Jenkins, Rosenman, & Friedman, 1967) and the Structured Interview (Hayes, Feinleib, & Kannel, 1980) in regard to Type-A classification. Many studies of hostility have used the MMPI Hostility scale devised by Cook & Medley in 1954. This 50-item questionnaire has been shown to be related to coronary artery disease (CAD) and the Type A Behavior Pattern (TABP). The CMHO scale seems to measure a very stable trait, however some evidence points out that it may be a better measure of cynicism. It has been established that the CMHO scale is linked to CAD and
mortality in general. Individuals who score higher on the CMHO experience anger at higher intensities and frequencies than low scorers.

Subjects were classified as "high hostile" by scoring 6 or above on their FTAS and 29 or above on the CMHO. Low hostile individuals were classified by scoring 5 or below on the FTAS and 20 or less on the CMHO. Using two measures to assess hostility has been purported to improve homogeneity and validity of appropriate subtypes and has been used before (Muranka, Lane, Suarez, Anderson, Suzuki, & Williams, 1988; Williams, Lane, Kuhn, Melosh, White, and Schanberg, 1982).

**Apparatus**

**Physiological.** A Grass model 7D polygraph unit with two model 7P1 DC pre-amplifiers was used to collect the skin conductance data across each measurement period. Beckman electrodes and Spectra 360 electrode gel was placed on opposite sides (hypothenar and thenar eminences) of the subject's lower palmar surface of each hand. Each of the four areas of epidermal contact were monitored separately by the polygraph unit. The two amplifiers and electrode leads used were counterbalanced across subjects. The experimental chamber contained a large cushioned chair facing a one-way observation window surrounded equi-distant on each side and the front and back by a white curtain. The experimenter was
seated in a separate sound-attenuated room with the polygraph unit. Subjects were monitored through the one-way observation window and a small hole cut in the curtain. Electrode attachment cables were connected to the polygraph unit via a small opening in the wall. The PGR circuit on the polygraph is designed so that pen deflection resulting from 1 MV input is equal to a resistance change of 10,000 ohms. Thus, the pen deflection sensitivity can be read in ohms/centimeters from the SENSITIVITY MV/CM switch by multiplying the reading by 10,000. Conductance scores (micromhos) were obtained by taking the inverse of the ohm reading and multiplying by 10 to the sixth power.

Video. A Panasonic WV-CD20 CCTV camera with a Panasonic WV-LA8B lens was placed behind the one-way observation window to record the subject's facial configurations throughout the experiment.

Procedure
The CMHO, FTAS, handedness, history questionnaires, BDI, and STAS were administered to the entire subject pool. Other measures given at this time included the State-Trait Anxiety scale and the Beck Depression Inventory in order to further define the nature of the subject pool. Thirty-four subjects were selected using the criteria mentioned above. Three declined to participate further leaving a total of 31 subjects with 18 in the high hostile group and 13 in the low
hostile group. Following recruitment and group placement, each subject was assigned a time to come to the laboratory. Upon arrival at the laboratory, the subject was asked to read and sign the informed-consent forms (see Appendix H). The subject was then seated in the cushioned recliner in its upright position. This allowed the experimenter to be able to decide when the subject had achieved the correct facial configuration. The experimenter then attached the electrodes and explained to the subject that he would be asked "to move certain facial muscles". The experimenter then stated "It is very important for you to follow precisely the directions I will give you. You may feel uncomfortable at times, but please try to maintain the facial configurations described to you. Let's practice a few". At this time the experimenter returned to the other room and began to instruct the subject in making the three facial configurations; happy, angry, and neutral. At no point in the experiment were any of the facial configurations referred to as happy, angry, or neutral, however. After successful completion of the facial configurations in the practice phase the subject was told to relax and a 3-minute baseline of skin conductance was taken. Following the baseline, the experimenter instructed the subject on how to make the first facial configuration again. The experimenter then said "Begin" and a 15-second
measurement was made. At the end of this period the subject was told to discontinue the configuration and relax. No formal relaxation procedures were used. The subjects were monitored to make sure that emotional facial configurations were not being made during the baseline period. Another 3-minute baseline was then taken. Following this, the experimenter instructed the subject in making the next facial configuration and it was held for 15-seconds. The subject was again asked to relax for a period of 3-minutes. Following this, the experimenter instructed the subject in making the third facial configuration and it was held for 15-seconds. After another 3-minute baseline, the procedure was repeated following the same pattern as before. Thus, two blocks for each facial configuration were attained. Following the last facial configuration trial, the electrodes were removed and the subject was debriefed. The order of facial configurations was counterbalanced across all subjects. All data were recorded from the polygraph paper to a data collection form.

*Validation of Facial Configurations.* Each subject was viewed in a retrospective playback of the videotape by two associate researchers trained by the primary researcher. They then rated the intensity of each facial configuration as well as the subject's success at meeting the necessary criteria for the configuration and maintaining it for the
appropriate time period (see Appendix I). Reliability coefficients were calculated.

Facial Configuration Instructions. The angry facial configuration was instructed by saying "Now I want you to pull your eyebrows down and together, raise your upper eyelid, and push your lower lip up". The standard or control face was instructed by saying "I want you to close your eyes and puff your cheeks out gently". The happy facial configuration was instructed by saying "Now I want you to lift your cheeks up, pull them back, and open your mouth slightly".
Results

Data were analyzed with a five factor mixed design repeated measures analysis of variance (ANOVA) with the fixed effect of group (high and low hostility), and the repeated factors of facial affect (happy, neutral, and angry), extremity (left and right distal upper extremities), block (first and second), and trial (baseline and test). Skin conductance value was the dependent measure for all analyses. Significance levels of main effects and interactions were computed with conservative degrees of freedom (Greenhouse & Geisser, 1959). Post-hoc comparisons were performed with Tukey's Honestly Significant Difference Procedure (HSD) (alpha=.05). In order to maintain the ANOVA assumption of equal group sizes five subjects were randomly removed from the high hostile group producing two groups of 13 subjects each.

Manipulation checks revealed that only two subjects had difficulty making the facial configurations (scoring an average of 2 or below on a 5-point Likert scale of facial configuration success) and their difficulty was limited to the affective faces. Also, the groups were equal (Rater 1: High Hostile mean=3.52, standard deviation (SD)=1.41, Low Hostile mean=3.33, SD=1.29; Rater 2: High Hostile mean=3.44, SD=1.15, Low Hostile mean=3.26, SD=1.13) on the scale in the
emotional intensity of their facial configurations as recorded by raters.

The high hostile group had a mean CMHO score of 32.9 (SD=3.6) and the low hostile group a mean of 16.2 (SD=2.9). Scores ranged from 29 to 40 in the high hostile group and from 11 to 20 in the low hostile group. Mean scores and standard deviations for the other instruments were as follows: high hostile FTAS=7.54, SD=1.08; BDI=11.31, SD=4.98; STAI-State=37.85, SD=7.23; STAI-Trait=46.54, SD=10.63: low hostile FTAS=3.62, SD=1.33; BDI=3.15, SD=2.99; STAI-State=31.23, SD=7.5; STAI-Trait=32.69, SD=8.25. Correlation analysis of the initial pool of subjects showed significant relationships among the CMHO, FTAS, BDI, and STAS (see Table 1).

Analysis of the skin conductance data demonstrated that hypothesis 1 was confirmed by a main effect of trial. Significantly higher skin conductance levels were noted during the facial configurations than during the baseline measures, \( F (1,24) = 16.61, p<.0004 \). The Affect x Trial interaction was also significant and confirmed hypothesis 2 (however, see discussion). More reactivity (change from baseline to facial configuration) was seen for angry faces, followed by happy, and then neutral \( F (2,48) = 8.96, p<.0005 \), (see Figure 1). Post-hoc comparisons indicated that conductance varied within each facial configuration.
Table 1

Pearson Correlation Coefficients

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M= 

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<td>10.53</td>
<td>10.7</td>
<td>6.43</td>
</tr>
</tbody>
</table>

* correlation significant p<.0001  
** correlation significant p<.0005  
*** correlation significant p<.001  
**** correlation significant p.01  
CMHO - Cook-Medley Hostility Scale  
FRAM - Framingham Type A Scale  
STAI - State-Trait Anxiety Inventory  
BDI - Beck Depression Inventory
Figure Caption

Figure 1. Skin conductance measured in micromhos as a function of Affect and Trial.
from baseline to test. However, among the angry and happy facial configurations, conductance was not significantly different at baseline or test. Conductance during both the angry and happy configurations was significantly different from neutral both at baseline and test. It should also be noted that in a separate test of only the happy and angry facial configurations, reliable differences in reactivity were found.

Hypothesis 3 received partial support only (see below). Hypothesis 4 was not confirmed. No significant interaction effect was noted for group and affect.

Hypothesis 5 and 6 were not confirmed. The Group x Extremity interaction and Group x Extremity x Affect were not significant. Another significant three-way interaction was found, however. The Group x Extremity x Block interaction, $F(1,24) = 8.12, p<.0089$, demonstrated a clear distinction between groups across the extremities when comparing Block 1 to Block 2 (see Figure 2). Post-hoc comparisons indicated that during Block 1 both extremities of the high hostile group demonstrated significantly more conductance than both extremities of the low hostile group. However, during Block 2, the right extremity of the high hostile group can only be differentiated from the left extremity of the low hostile group. Conductance at the left
extremity now differed significantly from both extremities of the low hostile group, as was hypothesized.

No other main effects or interaction effects were reliable. Of note for discussion purposes was the pattern of the non-significant interaction of Extremity x Affect (see Figure 3). Other interactions, some of which approached significance, are included in the ANOVA summary table (see Table 2).
Figure Caption

Figure 2  Skin conductance measured in micromhos as a function of Group, Extremity, and Block.
Table 2

Analysis of Variance (ANOVA) Summary Table

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>F Value</th>
<th>Pr. &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>1,24</td>
<td>.12</td>
<td>.7325</td>
</tr>
<tr>
<td>Affect</td>
<td>2,48</td>
<td>2.39</td>
<td>.1020</td>
</tr>
<tr>
<td>Extremity</td>
<td>1,24</td>
<td>.01</td>
<td>.9081</td>
</tr>
<tr>
<td>Block</td>
<td>1,24</td>
<td>.39</td>
<td>.5395</td>
</tr>
<tr>
<td>Trial</td>
<td>1,24</td>
<td>16.61</td>
<td>.0004</td>
</tr>
<tr>
<td>Group*Affect</td>
<td>2,48</td>
<td>2.14</td>
<td>.1284</td>
</tr>
<tr>
<td>Group*Extremity</td>
<td>1,24</td>
<td>.55</td>
<td>.4644</td>
</tr>
<tr>
<td>Extremity*Affect</td>
<td>2,48</td>
<td>2.23</td>
<td>.1190</td>
</tr>
<tr>
<td>Affect*Trial</td>
<td>2,48</td>
<td>8.96</td>
<td>.0005</td>
</tr>
<tr>
<td>Group<em>Affect</em>Extremity</td>
<td>2,48</td>
<td>.91</td>
<td>.4091</td>
</tr>
<tr>
<td>Group<em>Extremity</em>Block</td>
<td>1,24</td>
<td>8.12</td>
<td>.0089</td>
</tr>
</tbody>
</table>
Figure Caption

Figure 3  Skin conductance measured in micromhos as a function of the non-significant extremity by affect interaction.
**Discussion**

The primary finding of the present experiment was that males with high levels of hostility show heightened autonomic responses at the left extremity over time when making affective facial configurations. The results indicate that happy, angry, and neutral affective facial configurations may differentially induce autonomic correlates of heightened skin conductance. This latter finding partially replicates the results reported by Levenson, Ekman, & Friesen (1983).

First, a significant three-way interaction of Group, Extremity and Block was found. Autonomic responses at the right extremity in the high hostile group varied across Blocks. Diametrically opposite results were found for the left extremity which showed persistently higher conductance values across Blocks. Initially (Block 1), the left extremity of the high hostile group showed equivalent conductance to that measured at the right extremity. The high hostile group showed higher levels of conductance at both extremities at this initial point in the session. However, by Block 2 the right extremity was approaching the conductance levels of the low hostile group. Habituation seemed to have occurred in bilateral extremity measures of the low hostile group, whereas evidence of habituation is seen only in the right extremity measure of the high hostile
group. Measurement at the left extremity of the high hostile group showed persistence in high levels of skin conductance.

Effects across extremity became larger for both groups during the second Block indicating that extremity effects become more apparent with time and exposure. In addition, if one looks at Block 2 as approximating a stable state beyond that at Block 1, then hypothesis 5 would be confirmed and extremity differences among groups would be robust. Also, in reconsidering hypothesis 3 - that the left extremity would show more conductance than the right - there would be confirmation but only for the high hostile group.

An explanation involving altered right hemisphere function in males with high levels of hostility seems appropriate for this phenomenon. Research indicates that inertia of affect (Cummings & Mendez, 1984; Gainotti, 1982) and affective lability (Robinson, Parikh, Lipsey, Starkstein, and Price, 1993) often result from right hemisphere dysfunction. These individuals are likely to respond in an affectively inappropriate way to various cues. They are also likely to "perseverate" on negative emotional valences. In a recent case study (Demakis, Herridge, & Harrison, 1993) on affective lability in a woman who had a right hemisphere stroke, a similar effect was noted. The patient showed heightened levels of skin conductance and
reactivity to emotional cues accompanied by behavioral lability. Though this was an extreme case, dysfunction within this cerebrum may possibly produce similar behavior of smaller magnitude. The higher conductance level at the left extremity of the high hostile group is consistent with this hypothesis.

If high hostiles do perseverate autonomically after reacting to an emotional incident, then a link to the literature on cardiovascular risk in this population may be indicated. This offers researcher a novel way in which to view heightened levels of hostility. These individuals may react more and maintain states of high autonomic arousal for longer periods of time than low hostiles due to altered right hemisphere functioning. This may be triggered by emotional stimuli of either valence, or through altered appraisal of neutral stimuli as having a negative valence (Harrison, Gorelczenko, and Cock, 1990).

Second, it was found that simply moving facial muscles into a configuration universally recognized as happy, angry, or neutral produced skin conductance responses, essentially replicating Levenson, Ekman, Friesen (1983). It was also found that the angry, happy, and neutral configurations produced skin conductance responses that varied in magnitude, respectively. As predicted, the angry facial configuration showed the highest reactivity, followed by the
happy facial configuration, and then the neutral facial configuration. The angry configuration resulted in reactivity beyond that found for happy configurations. Both angry and happy configurations resulted in reactivity beyond that found for the neutral configuration.

Discussion of this latter finding (i.e. neutral affect) must be qualified due to baseline discrepancies among the Affect types. The neutral baseline differed from the baseline values of the other affect valences. Exploration of the neutral baseline difference in the Affect x Trial interaction revealed that the neutral facial configuration occurred less often as the first or second facial configuration than did the happy or angry facial configurations (H=18, A=19, N=15). This is likely to have produced the disparity between the neutral baseline and the angry and happy baselines because habituation seems to have occurred across time in this experiment.

Baseline conductance levels dropped during the second block as the subjects habituated to the experimental situation. Thus, the more often a facial configuration occurred as the last of the three, the more likely it was to have a lower mean skin conductance value. Sturgis & Gramling (1988) point out that a common annoyance in electrodermal measurement is that level changes may be of a relatively large magnitude compared to responses elicited by
specific stimuli. Due to the law of initial values (LIV) (Wilder, 1931, 1957), however, this does not seem to confound this interaction. Within subjects measures, behaving in accordance with the LIV, would be predicted to show more of a response increment in conditions where the initial values were lower (Furedy & Scher, 1989). Thus, the neutral configuration would be expected to show greater increases than the angry or happy configurations. This was not the case with these results. The affective faces showed more of a response (reactivity) than the neutral face.

Clear evidence for the neural systems theory of affect discussed earlier was not found. Both positive and negative valenced facial configuration were not reliably discriminated across extremity. However, the extremities did show a trend wherein different patterns of skin conductance were evident. Neutral affect was more similar across extremities than happy or angry affect. Angry affect resulted in higher levels of conductance than happy affect configurations at the left extremity while they were more similar on the right extremity (see Figure 3). This offers partial support for neural systems theory as a potentially useful paradigm in the study of affective lateralization requiring additional research. Reliable findings related to this theory may have been limited because of the nature of the facial recognition task. Recent research has indicated
that some types of happy facial configurations produce different physiological results than others. Thus, the facial configuration should involve musculature that has been shown to produce autonomic responses most similar to those produced by spontaneous and intense facial configurations.

Other limitations of this experiment include the use of only two blocks and the brief nature of the experimental session (25-30 minutes). A larger number of blocks and longer baseline periods would allow subjects to reach a more stable state. This would offer the researcher greater evidence for generalizing results to the subjects' normal state. Skin conductance reactivity to the facial configurations may also show greater differentiation across extremities and between groups with longer experimental sessions. This could help confirm experimental hypotheses regarding extremity variations among facial configurations that were not found in this experiment.

Significant positive correlations were found between the hostility measures and the anxiety and depression measures. This relationship is commonly found. Covariate statistics could be used to better examine the effect of hostility alone on skin conductance. It is also possible that more stringent criteria for groups could be used producing a high hostile-low anxious/depressed group. A
final limitation was that self-report measures were used to
categorize subjects for a test of physiological responses.
Hostility could have also be operationally defined as hyper-
reactivity to stimuli and made more relevant to the
dependent measure.

Future research should focus on altered autonomic
expression in individuals with high levels of hostility in
response to emotional or non-emotional cues. Other types
of autonomic responses such as heart rate, blood pressure,
and blood volume pulse may be appropriate because of their
relevance to cardiovascular risk. This autonomic alteration
(or dysfunction in terms of social interaction and
cardiovascular risk) in high hostile individuals, if
confirmed, could help link the hostility/coronary artery
disease literature with that of functional cerebral systems.
Integration of literatures on cardiovascular risk and the
neuropsychology of hostility is needed to open potentially
vital research avenues for the future.

Also, continued use of bilateral measurements is
recommended in research utilizing skin conductance as an
expression of cerebral activity. Different results across
extremities are likely, especially in experiments utilizing
affective variables.
References


Appendix A

Directions: If a statement is true or mostly true, as pertaining to you, circle the letter T. If a statement is false or usually not true about you, circle the letter F. Try to give a response to every statement.

1. When I take a new job, I like to be tipped off on who should be gotten next to. T F

2. When someone does me wrong I feel I should pay him back if I can, just for the principle of the thing. T F

3. I prefer to pass by school friends, or people I know but have not seen for a long time, unless they speak to me first. T F

4. I have often had to take orders from someone who did not know as much as I did. T F

5. I think a great many people exaggerate their misfortunes in order to gain the sympathy and help of others. T F

6. It takes a lot of argument to convince most people of the truth. T F

7. I think most people would lie to get ahead. T F

8. Someone has it in for me. T F

9. Most people are honest chiefly through the fear of getting caught. T F

10. Most people will use somewhat unfair means to gain profit or an advantage rather than to lose it. T F

11. I commonly wonder what hidden reason another person may have for doing something nice for me. T F

12. It makes me impatient to have people ask my advice or otherwise interrupt me when I am working on something important. T F

13. I feel that I have often been punished without cause. T F

14. I am against giving money to beggars. T F

15. Some of my family have habits that bother and annoy me very much. T F

16. My relatives are nearly all in sympathy with me. T F

17. My way of doing things is apt to be misunderstood by others. T F

18. I don't blame anyone for trying to grab everything he can get in this world. T F
19. No one cares much what happens to you.  
20. I can be friendly with people who do things which I consider wrong.  
21. It is safer to trust nobody.  
22. I do not blame a person for taking advantage of someone who lays himself open to it.  
23. I have often felt that strangers were looking at me critically.  
24. Most people make friends because friends are likely to be useful to them.  
25. I am sure I am being talked about.  
26. I am likely not to speak to people until they speak to me.  
27. Most people inwardly dislike putting themselves out to help other people.  
28. I tend to be on guard with people who are somewhat more friendly than I had expected.  
29. I have sometimes stayed away from another person because I feared saying or doing something that I might regret afterwards.  
30. People often disappoint me.  
31. I like to keep people guessing what I'm going to do next.  
32. I frequently ask people for advice.  
33. I am not easily angered.  
34. I have often met people who were supposed to be experts who were no better than I.  
35. I would certainly enjoy beating a crook at his own game.  
36. It makes me think of failure when I hear of the success of someone I know well.  
37. I have at times had to be rough with people who were rude or annoying.  
38. People generally demand more respect for their own rights than they are willing to allow for others.
39. There are certain people whom I dislike so much that I am inwardly pleased when they are catching it for something they have done.

40. I am often inclined to go out of my way to win a point with someone who has opposed me.

41. I am quite often not in on the gossip and talk of the group I belong to.

42. The man who had most to do with me when I was a child (such as my father, step-father, etc.) was very strict with me.

43. I have often found people jealous of my good ideas just because they had not thought of them first.

44. When a man is with a woman he is usually thinking about things related to her sex.

45. I do not try to cover up my poor opinion or pity of a person so that he won't know how I feel.

46. I have frequently worked under people who seem to have things arranged so that they credit for good work but are able to pass off mistakes onto those under them.

47. I strongly defend my own opinions as a rule.

48. People can pretty easily change me even though I thought that my mind was already made up on a subject.

49. Sometimes I am sure that other people can tell what I am thinking.

50. A large number of people are guilty of bad sexual conduct.
Appendix B

Directions: Place a check mark in the appropriate space after each item.

<table>
<thead>
<tr>
<th>Traits and qualities which describe you:</th>
<th>Very Well</th>
<th>Fairly Well</th>
<th>Somewhat Well</th>
<th>Does Not</th>
</tr>
</thead>
<tbody>
<tr>
<td>Being hard-driving and competitive.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usually pressed for time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Being bossy or dominating.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Having a strong need to excel in most things.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eating too quickly.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Feelings at the end of an average day of school or work:

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Often felt very pressed for time.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work stayed with you so you were thinking about it after hours.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work often stretched you to the very limits of your energy and capacity.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Often felt uncertain, uncomfortable, or dissatisfied with how well you were doing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you get upset when you have to wait for anything?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix C

HISTORY QUESTIONNAIRE

Have you ever experienced or been diagnosed with any of the following, or are you experiencing any of the following at present? Please circle the appropriate response and explain "Yes" answers below.

1. Vision difficulties, blurred vision or eye disorders
   Yes  No

2. Blindness in either eye
   Yes  No

3. If Yes to either of the above, have problems been corrected
   Yes  No

4. Severe head trauma/injury
   Yes  No

5. Stroke
   Yes  No

6. Learning disabilities (problems of reading, writing, or comprehension)
   Yes  No

7. Epilepsy or seizures
   Yes  No

8. Paralysis
   Yes  No

9. Neurological surgery
   Yes  No

Please explain any "Yes" responses:

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
Appendix D

BECK INVENTORY

Name. ___________________________ Date ___________________________

In this questionnaire are groups of statements. Please read each group of statements carefully. Then pick out the one statement in each group which best describes the way you have been feeling the past week, including today. Circle the number beside the statement you picked. If several statements in the group seem to apply equally well, circle each one. Be sure to read all the statements in each group before making your choice.

1 0 I do not feel sad.
   1 I feel sad.
   2 I am sad all the time and I can’t snap out of it.
   3 I am so sad or unhappy that I can’t stand it.

2 0 I am not particularly discouraged about the future.
   1 I feel discouraged about the future.
   2 I feel I have nothing to look forward to.
   3 I feel that the future is hopeless and that things cannot improve.

3 0 I do not feel like a failure.
   1 I feel I have failed more than the average person.
   2 As I look back on my life, all I can see is a lot of failures.
   3 I feel I am a complete failure as a person.

4 0 I get as much satisfaction out of things as I used to.
   1 I don’t enjoy things the way I used to.
   2 I don’t get real satisfaction out of anything anymore.
   3 I am disillusioned or bored with everything.

5 0 I don’t feel particularly guilty.
   1 I feel guilty a good part of the time.
   2 I feel quite guilty most of the time.
   3 I feel guilty all of the time.

6 0 I don’t feel I am being punished.
   1 I feel I may be punished.
   2 I expect to be punished.
   3 I feel I am being punished.

7 0 I don’t feel disappointed in myself.
   1 I am disappointed in myself.
   2 I am disgusted with myself.
   3 I hate myself.

8 0 I don’t feel I am any worse than anybody else.
   1 I am critical of myself for my weaknesses or mistakes.
   2 I blame myself all the time for my faults.
   3 I blame myself for everything bad that happens.

9 0 I don’t have any thoughts of killing myself.
   1 I have thoughts of killing myself, but I would not carry them out.
   2 I would like to kill myself.
   3 I would kill myself if I had the chance.

0 0 I don’t cry any more than usual.
   1 I cry more now than I used to.
   2 I cry all the time now.
   3 I used to be able to cry, but now I can’t cry even though I want to.

1 0 I am no more irritated now than I ever was.
   1 I get annoyed or iritated more easily than I used to.
   2 I feel irritated all the time now.
   3 I don’t get irritated at all by the things that used to irritate me.

12 0 I have not lost interest in other people.
   1 I am less interested in other people than I used to be.
   2 I have lost most of my interest in other people.
   3 I have lost all of my interest in other people.

13 0 I make decisions about as well as I ever could.
   1 I put off making decisions more than I used to.
   2 I have greater difficulty in making decisions than before.
   3 I can’t make decisions at all anymore.

14 0 I don’t feel I look any worse than I used to.
   1 I am worried that I am looking old or unattractive.
   2 I feel that there are permanent changes in my appearance that make me look unattractive.
   3 I believe that I look ugly.

15 0 I can work about as well as before.
   1 It takes me extra effort to get started at doing something.
   2 I have to push myself very hard to do anything.
   3 I can’t do any work at all.

16 0 I can sleep as well as usual.
   1 I don’t sleep as well as I used to.
   2 I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
   3 I wake up several hours earlier than I used to and cannot get back to sleep.

17 0 I don’t get more tired than usual.
   1 I get tired more easily than I used to.
   2 I get tired from doing almost anything.
   3 I am too tired to do anything.

18 0 My appetite is no worse than usual.
   1 My appetite is not as good as it used to be.
   2 My appetite is much worse now.
   3 I have no appetite at all anymore.

19 0 I haven’t lost much weight.
   1 I have lost more than 5 pounds.
   2 I have lost more than 10 pounds.
   3 I have lost more than 15 pounds.

20 0 I am no more worried about my health than usual.
   1 I am worried about physical problems such as aches and pains, or upset stomach, or constipation.
   2 I am very worried about physical problems and it’s hard to think of much else.
   3 I am worried about my physical problems that I cannot think about anything else.

21 0 I have not noticed any recent change in my interest in sex.
   1 I am less interested in sex than I used to be.
   2 I am much less interested in sex now.
   3 I have lost interest in sex completely.
Appendix E

SELF-EVALUATION QUESTIONNAIRE

Developed by Charles D. Spielberger
in collaboration with
R. L. Gorsuch, R. Lushene, P. R. Vagg, and G. A. Jacobs

STAI Form Y-1

Name __________________________ Date ______ S _____
Age _______ Sex: M ______ F ______

DIRECTIONS: A number of statements which people have used to
describe themselves are given below. Read each statement and then
blacken in the appropriate circle to the right of the statement to in-
dicate how you feel right now, that is, at this moment. There are no right
or wrong answers. Do not spend too much time on any one statement
but give the answer which seems to describe your present feelings best.

1. I feel calm ............................................ 0 0 0 0
2. I feel secure ........................................... 0 0 0 0
3. I am tense ............................................. 0 0 0 0
4. I feel strained ........................................ 0 0 0 0
5. I feel at ease ......................................... 0 0 0 0
6. I feel upset ........................................... 0 0 0 0
7. I am presently worrying over possible misfortunes .................. 0 0 0 0
8. I feel satisfied ........................................ 0 0 0 0
9. I feel frightened ..................................... 0 0 0 0
10. I feel comfortable ................................... 0 0 0 0
11. I feel self-confident ................................ 0 0 0 0
12. I feel nervous ....................................... 0 0 0 0
13. I am jittery .......................................... 0 0 0 0
14. I feel indecisive ..................................... 0 0 0 0
15. I am relaxed ........................................ 0 0 0 0
16. I feel content ....................................... 0 0 0 0
17. I am worried ........................................ 0 0 0 0
18. I feel confused ..................................... 0 0 0 0
19. I feel steady ........................................ 0 0 0 0
20. I feel pleasant ...................................... 0 0 0 0

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57
SELF-EVALUATION QUESTIONNAIRE
STAI Form V-2

Name ___________________________ Date __________

DIRECTIONS: A number of statements which people have used to
describe themselves are given below. Read each statement and then
blacken in the appropriate circle to the right of the statement to in-
dicate how you generally feel. There are no right or wrong answers. Do
not spend too much time on any one statement but give the answer
which seems to describe how you generally feel.

21. I feel pleasant ..................................................... 0 0 0 0
22. I feel nervous and restless ........................................ 0 0 0 0
23. I feel satisfied with myself ....................................... 0 0 0 0
24. I wish I could be as happy as others seem to be .............. 0 0 0 0
25. I feel like a failure ............................................. 0 0 0 0
26. I feel rested ..................................................... 0 0 0 0
27. I am “calm, cool, and collected” ................................ 0 0 0 0
28. I feel that difficulties are piling up so that I cannot overcome them 0 0 0 0
29. I worry too much over something that really doesn’t matter ...... 0 0 0 0
30. I am happy .......................................................... 0 0 0 0
31. I have disturbing thoughts ........................................ 0 0 0 0
32. I lack self-confidence .......................................... 0 0 0 0
33. I feel secure ..................................................... 0 0 0 0
34. I make decisions easily ......................................... 0 0 0 0
35. I feel inadequate ................................................ 0 0 0 0
36. I am content .................................................... 0 0 0 0
37. Some unimportant thought runs through my mind and bothers me 0 0 0 0
38. I take disappointments so keenly that I can't put them out of my
mind ................................................................. 0 0 0 0
39. I am a steady person ........................................... 0 0 0 0
40. I get in a state of tension or turmoil as I think over my recent concerns
and interests ..................................................... 0 0 0 0

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Appendix F
INFORMED CONSENT TO PARTICIPATE IN RESEARCH

TITLE OF EXPERIMENT: Facial Configuration, Hostility, and Bilateral Asymmetry on Skin Conductance.
EXPERIMENT #:______

You are being asked to volunteer as a participant in a research study. This form is designed to provide you with information about the study and to answer any of your questions.

Purpose of the Research
To evaluate your physiological reaction to making certain facial configurations.

Experimental Procedure
You will be hooked up to a polygraph machine utilizing surface electrodes. The surface electrodes will be attached to both of your palms. An adhesive on the electrode is used and is not painful. The task will involve making various facial configurations. The experiment should take 1 hour to complete.

Introductory Psychology Students Extra Credit
If you are currently taking Introductory Psychology, you will receive one point toward your final grade for your participation in this stage of this experiment.

Anonymity of Subjects and Confidentiality of the Results
The results of this study will be kept strictly confidential. At no time will the researchers release the results of the study to anyone other than individuals working on the project without your written consent. The information you provide will have your name removed and only a subject number will identify you during analyses and write-ups of the research. The experiment will be videotaped. These tapes will only be viewed by the individuals working on the project and will be erased after completion of the study.

Risks
If you wish to discuss these or any other discomforts you may experience, you may call the project director. Because most of the tests are mainly evaluative, there are no serious risks involved. If any discomfort, from the electrodes, is felt, please let us know and we will stop the tests. You can cease participation in the experiment at any time. The session should last from 20-30 minutes.
Potential Benefits
By participating in this study, you may gain new knowledge of experimental design or protocol which might prove helpful in the future. If you wish to know the results of your tests, you can receive this information at the end of the study.

Freedom to Withdraw
You are free to withdraw from participation in this study at any time without penalty.

Use of Research Data
The information from this research may be used for scientific or educational purposes. It may be presented at scientific meetings and/or published and republished in professional journals or books, or used for any other purpose which Virginia Tech's Department of Psychology considers proper in the interest of education, knowledge, or research.

Approval of Research
This research project has been approved by the Human Subjects Committee of the Department of Psychology and by the Institutional Review Board of Virginia Tech.

Subject's Permission

1. I have read and understand the above description of the study. I have had an opportunity to ask questions and have them all answered. I hereby acknowledge the above and give my voluntary consent for participation in this study.

2. I also understand that if I participate I may withdraw at any time without penalty.

3. I understand that should I have any questions about this research and its conduct, I should contact any of the following:

Primary Researcher: Matthew L. Herridge  
phone: 381-2238  
Project Director: David W. Harrison  
phone: 231-4422  
Chair, HSC: Joseph J. Franchina  
phone: 231-5664  
Chair, IRB: Janet Johnson  
phone: 231-6077

Subject's Signature: ________________________________
Date: ________
# Appendix G

## Handedness Questionnaire

Subject #:____________

Circle the appropriate number after each item.

<table>
<thead>
<tr>
<th>Item</th>
<th>Right</th>
<th>Left</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td>With which hand would you throw a ball to hit a target?</td>
<td></td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>With which hand do you draw?</td>
<td></td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>With which hand do you use an eraser on paper?</td>
<td></td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>With which hand do you remove the top card when dealing?</td>
<td></td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>With which foot do you kick a ball?</td>
<td></td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>If you wanted to pick up a pebble with your toes, which foot would you use?</td>
<td></td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>If you had to step up onto a chair, which foot would you place on the chair first?</td>
<td></td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>Which eye would you use to peep through a keyhole?</td>
<td></td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>If you had to look into a dark bottle to see how full it was, which eye would you use?</td>
<td></td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>Which eye would you use to sight down a rifle?</td>
<td></td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>If you wanted to listen to a conversation going on behind a closed door, which ear would you place against the door?</td>
<td></td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>If you wanted to listen to someone’s heartbeat, which ear would you place against their chest?</td>
<td></td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>Into which ear would you place the earphone of a transistor radio?</td>
<td></td>
<td>-1</td>
<td>0</td>
</tr>
</tbody>
</table>

# of Right + # of Left = Total Score

——— + ——— = ______

Is mother left or right hand dominant? ______

Is father left or right hand dominant? ______
Appendix H
INFORMED CONSENT TO PARTICIPATE IN RESEARCH

TITLE OF EXPERIMENT: Facial Configuration, Hostility, and Bilateral Asymmetry on Skin Conductance.
EXPERIMENT #: _____

You are being asked to volunteer as a participant in a research study. This form is designed to provide you with information about the study and to answer any of your questions.

Purpose of the Research
To evaluate whether you will be chosen to further participate in this experimental study of personality traits and physiological responses.

Experimental Procedure
You will be asked to fill out some questionnaires. Some of the questions may be personal in nature. If they are too personal you do not have to answer them. The experiment should take less than 1 hour to complete.

Introductory Psychology Students Extra Credit
If you are currently taking Introductory Psychology, you will receive one point toward your final grade for your participation in this stage of this research.

Anonymity of Subjects and Confidentiality of the Results
The results of this study will be kept strictly confidential. At no time will the researchers release the of the study to anyone other than individuals working on the project without your written consent. The information you provide will have your name removed and only a subject number will identify you during analyses and write-ups of the research.

Risks
If you wish to discuss these or any other discomforts you may experience, you may call the project director. Because most of the tests are mainly evaluative, there are no serious risks involved. You can cease participation in the experiment at any time.

Potential Benefits
By participating in this study, you may gain new knowledge of experimental design or protocol which might prove helpful in the future. If you wish to know the results of your tests, you can receive this information at the end of the study.
Freedom to Withdraw
You are free to withdraw from participation in this study at any time without penalty.

Use of Research Data
The information from this research may be used for scientific or educational purposes. It may be presented at scientific meetings and/or published and republished in professional journals or books, or used for any other purpose which Virginia Tech's Department of Psychology considers proper in the interest of education, knowledge, or research.

Approval of Research
This research project has been approved by the Human Subjects Committee of the Department of Psychology and by the Institutional Review Board of Virginia Tech.

Subject's Permission

1. I have read and understand the above description of the study. I have had an opportunity to ask questions and have them all answered. I hereby acknowledge the above and give my voluntary consent for participation in this study.

2. I also understand that if I participate I may withdraw at any time without penalty.

3. I understand that should I have any questions about this research and its conduct, I should contact any of the following:

Primary Researcher: Matthew L. Herridge
phone: 381-2238

Project Director: David W. Harrison
phone: 231-4422

Chair, HSC: Joseph J. Franchina
phone: 231-5664

Chair, IRB: Janet Johnson
phone: 231-6077

Subject's Signature: ________________________________
Date: ________
### Appendix I

#### Rater's Form

<table>
<thead>
<tr>
<th>Emotion</th>
<th>Trial 1</th>
<th>Trial 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Happy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheeks Lifted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheeks Pulled Back</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mouth Open</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall Intensity (1-5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Angry</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eyebrows down and together</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper Eyelid Lifted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Lip Pushed Up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall Intensity (1-5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Neutral</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eyes Closed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheeks Puffed Out</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall Intensity (1-5)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Vita**

**Name:** Matthew L. Herridge

**Date of Birth:** August 17, 1967, Parkersburg, WV

**Mailing Address:** 403 Ardmore Street
Blackburg, VA 24060

**Phone:** Home - (703) 953-1476

**Education:**
Ohio Valley College (OVC), 8/85 - 5/87, A.A.
Harding University (HU), 8/87 - 5/89, B.A.
Abilene Christian University (ACU), 8/89 - 5/91
Virginia Tech (VT), M.S., 8/91 -

**Undergraduate Major:** Psychology

**Undergraduate Minor:** Biology

**Graduate Major:** Clinical Psychology

**Graduate Specialization:** Neuropsychology

**G.P.A. History:**

**Undergraduate**
Psychology G.P.A.: 3.92
Overall G.P.A.: 3.15

**Graduate**
ACU G.P.A.: 3.94
Tech G.P.A. (present): 3.56

**Academic Honors:**
ACT Scholarship
President of Psychology Club - HU
Outstanding Male Psychology Student - HU
Outstanding Psychology Graduate Student - ACU

Clinical Experience:
Practicum I ACU - 100 hours, clients were students at ACU and children in Abilene
Practicum II ACU - ACU Counseling Center: 246 hours, clients were students at ACU
Practicum III ACU - Big Spring State Hospital: 160 hours, clients were adults and adolescents who were residents at the State Hospital.

-Psychological Assistant, Adolescent Unit, Big Spring State Hospital 5/89-8/89, clients were strictly adolescents at the State Hospital. I was hired for the summer on the Adolescent Unit at BSSH. Due to the lack of a psychologist on this unit, I was asked to fulfill his/her duties which involved complete assessments of all patients, one hour of therapy per patient per week, group therapy, and participation in diagnosis and treatment evaluation. The unit housed approximately 20 patients.

-Practicum II VT - 8/91-5/92, therapy with 5 to 6 clients per week, group meeting, and individual supervision
Externship Salem Veteran Affairs Hospital - 5/92-8/93, psychological consultation for medical staff, co-facilitator
for PTSD ward, group facilitator for stroke support, chronic pain, and stop smoking groups

-Practicum IV VT - 8/92-5/93, Neuropsychology team, evaluation and therapy for neuropsychologically impaired clients

-Therapy experience - 5/93-8/93, Hired by VT as summer graduate therapist, 15 hours per week.

-Note: Virginia Tech's Clinical Practicum Training requires a minimum of 1200 hours across 4 years. I completed these requirements in May, 1993 and will continue to be involved in therapy for the remaining time at Tech.

-Additional Practicum Experience VT - 8/93-12/93, Neuropsychology team, evaluation and therapy for neuropsychologically impaired clients

Teaching Experience:

Ohio Valley College

-Teaching Assistant for 3rd grade - Spring 1987

Abilene Christian University

-Teaching Assistant for Introductory Psychology, Theories of Personality, History and Systems, and Abnormal Psychology - 8/89 - 5/91

Duties included test construction, grading, and guest lectures.
Virginia Tech

-Lab instructor for 5 sections of 30 -40 students each in Introductory Psychology - 8/91-5/92, responsible for lectures, grading and test construction.

-Teaching Assistant for Abnormal Psychology - Fall, 1991, responsible for grading and test administration

-Guest lectured for two sessions of Introductory Psychology course in auditorium

-Frequently given class presentations for graduate courses.

-Teaching Assistant for graduate Research Methods course, Fall 1993, guest lectured class

-Served as faculty adjunct instructor at Hollins College in Roanake, VA. Taught Neuropsychology and Neuropsychology Assessment course for their M.S. program, 8/93-5/94.

Graduate Assistantships:

Abilene Christian University

Teaching Assistantship - Fall 1989, Spring 1990, Fall 1990, Spring 1991

Virginia Tech

Teaching Assistantship - Fall 1991, Spring 1992

Clinical Assistantship - Fall 1992, Spring 1993

Teaching Assistantship - Fall 1993

Work Experience:

5//83 to 5/84 - Pease Building Supply, Belpre, OH

Delivery and Dock Worker
5/84 to 8/86 - Leavitt Funeral Home, Parkersburg, WV
Assistant Funeral Director

5/87 to 8/87 - JCPenney, Parkersburg, WV
Shoe Salesman

5/88 to 8/88 - DuPont, Washington Works, Wash. WV
Research and Development

5/89 to 8/89 - Charton Management, Parkersburg, WV

5/91 to 8/91 - Big Spring State Hospital, Big Spring, TX
Psychological Assistant

5/92 to 8/92 - Salem V.A. Hospital, Salem VA
Psychological Associate

5/93 to 8/93 - Virginia Tech Psychological Services Center, Blacksburg, VA, Graduate Clinician

5/93 to 8/93 - American Cancer Association
Graduate Researcher

Research:

ACU

- Hardiness and hostility as predictors of coronary artery bypass surgery outcome. Presented at the Virginia Psychological Association Conference, April 1993

- Developmental psychopathology: The overlap of self-reported depression and conduct disorder. Presented at Southwestern Psychological Association convention, April 1991
Virginia Tech
- Investigation of bilateral autonomic response differences between high and low hostile individuals through the use of affective facial configurations (Thesis).
- Investigation of correlations between Post traumatic stress disorder, male gender role stress, hostility, and outcome variables within a 30-day treatment program.
- Skin Cancer Prevention study focusing on eliciting safe behaviors from swimming pool patrons
- Single case study focusing on effects of right hemisphere stroke on affect expression
- Single case study focusing on flooding as an intervention for anxiety-provoked regurgitation in a 5-year old.

Psychology Coursework:
Ohio Valley College
General Psychology
Human Growth and Development

Harding University
Psychology of Personality
Experimental Psychology
Behavioral Disorders
Psychology of Learning
Physiological Psychology
History and Systems
Counseling
Experimental Psychology Seminar
Techniques of Counseling
Abilene Christian University
Tests and Measurements
General Research Methods
Intelligence Testing
Introduction to Clinical Psychology
Advanced Psychotherapeutic Techniques
Intermediate Statistics
Clinical Assessment
Advanced Psychopathology
Introduction to Biofeedback
Introduction to Neuropsychological Assessment
Sexual Therapy
Behavioral Medicine
Virginia Tech
Assessment of Human Intelligence
Research Methods
Statistics I for Social Sciences
Behavioral Assessment and Treatment
Child Psychopathology
Proseminar in Learning
Clinical Neuropsychology
Proseminar in Social Psychology
Proseminar in Personality
Statistics II for Social Sciences
Proseminar in Developmental Psychology
Advanced Psychotherapeutic Techniques